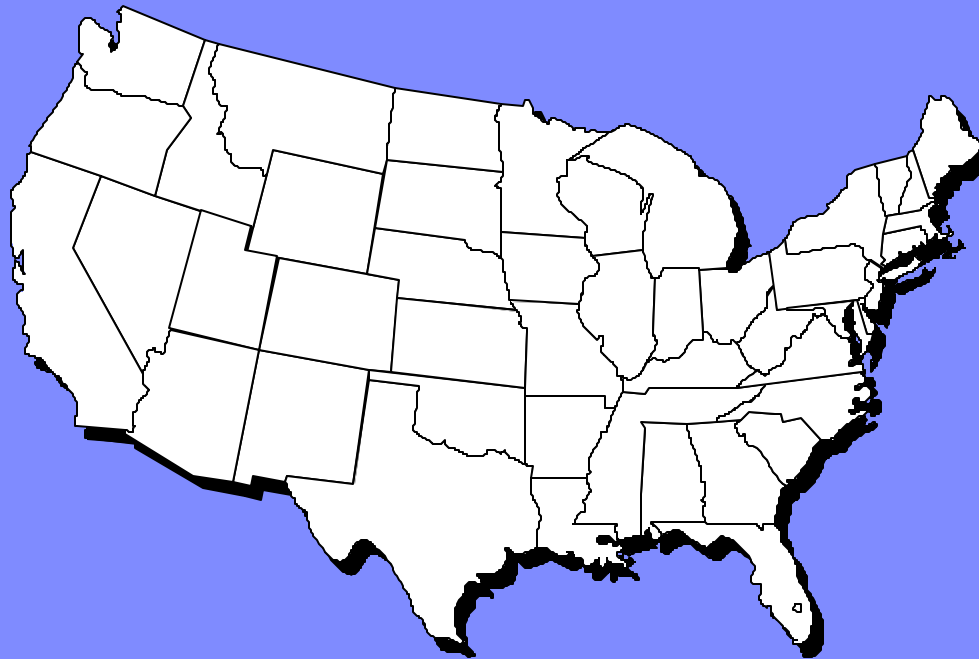


BROACH *US Market*



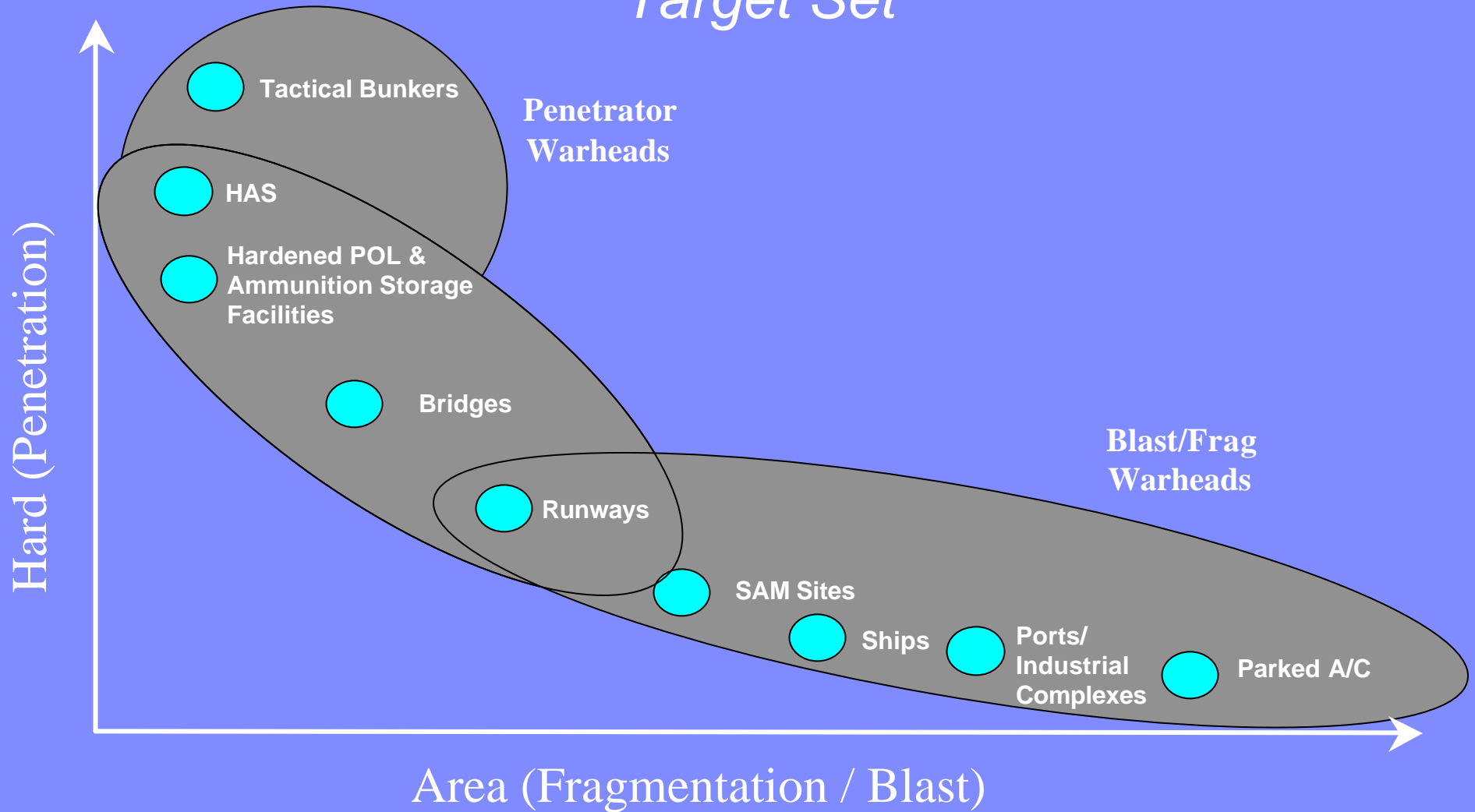
Dick Wools
Director, BROACH Programs

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Target Set



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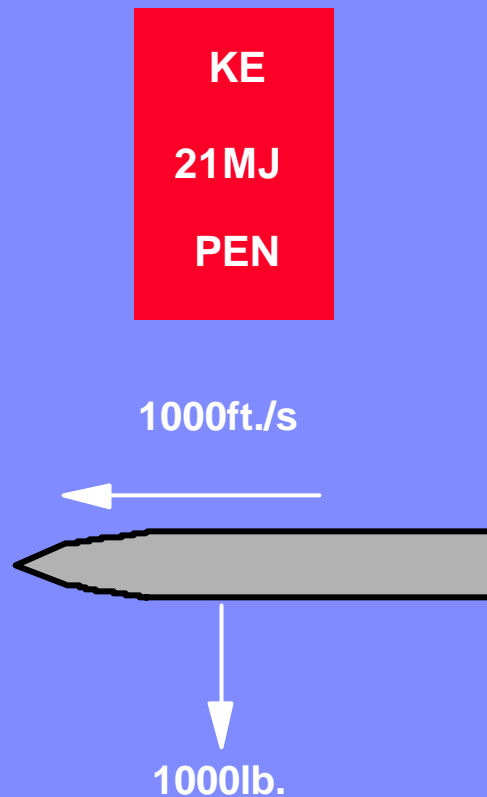
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Outline Requirement For a New Warhead

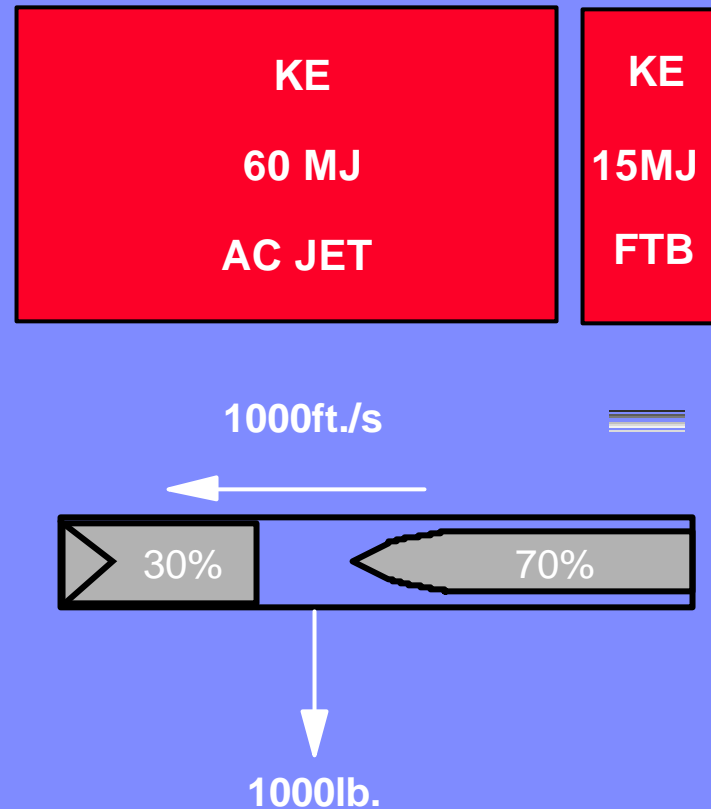
- Good Penetration Capability
- Good Fragmentation and Blast Performance
- Low Sensitivity to:-
 - ▶ Impact velocity
 - ▶ Ricochet
 - ▶ Pitch and yaw

MWS Design Rational Energy Comparisons

CONVENTIONAL KE



MULTIPLE WARHEAD SYSTEM



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BROACH PRINCIPLE OF OPERATION

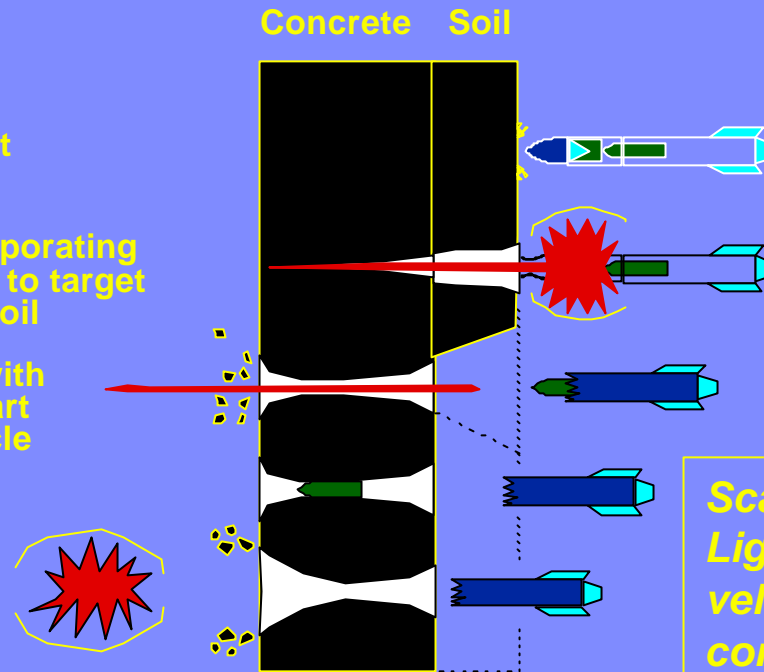
Contact sensor detects target

BROACH AC Operation incorporating Blast/Fragmentation external to target and clearance of remaining soil

Jet Penetration/Perforation with internal overpressure and start of FTB Separation from vehicle

Follow Through Bomb interaction with target

Detonation of FTB within target structure



*Scaleable to many systems.
Light. Flexible. Insensitive to
velocity and Impact Angle. IM
compliant.*

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BROACH MAJOR MILESTONES

- Jan 1991 - One third scale firings of BROACH initial design concept
- July 1992 - Static full size (18") system tested against 3m concrete at Pendine
- Nov 1992 - Dynamic full size (18") system tested against 3m concrete at Pendine
- Mar 1996 - Dynamic tests of BROACH in JSOW against HAS & Bridge Pier at Pendine
- Nov 1996 - Formation of Team BROACH
- June 1997 - Dynamic tests of BROACH in Storm Shadow. Monolithic targets at Pendine
- Apr 1998 - JSOW Insensitive Munitions tests successfully completed at China Lake
- May 1998 - Blast/Frag testing of BROACH in JSOW completed at Eglin, Florida
- May 1998 - Dynamic CALCM test against layered reinforced concrete at Pendine
- Dec 1998 - Dynamic CALCM test against soil overlaid target at Eglin, Florida
- July 1999 - SS Defeat of both hardest UK targets with fully representative system
- Dec 1999 - BROACH IT Technical Demonstrator
- Dec 2000 – Fuze Functionality Test



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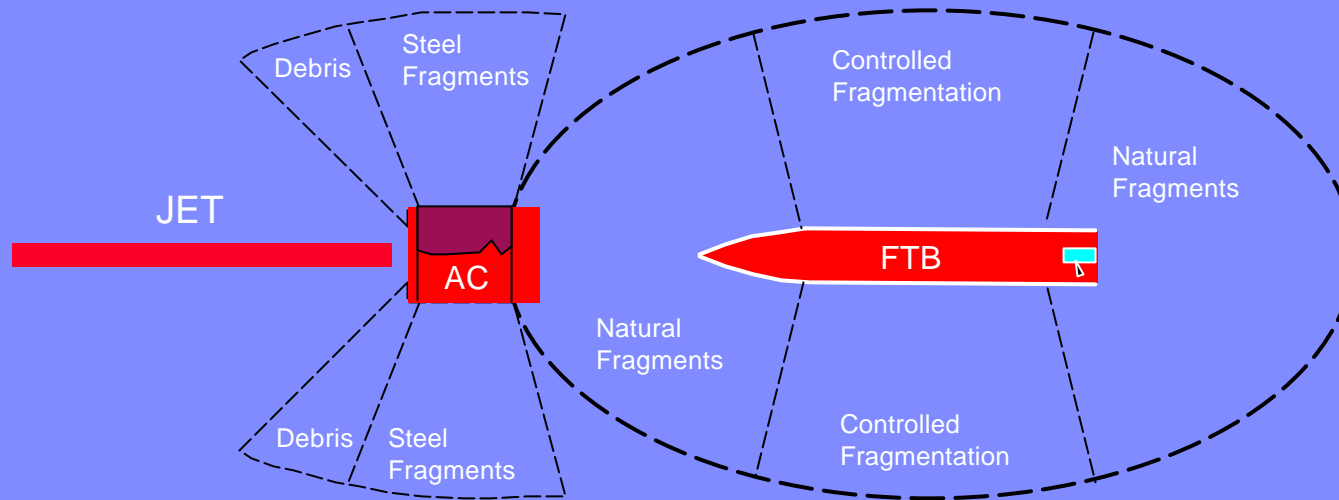
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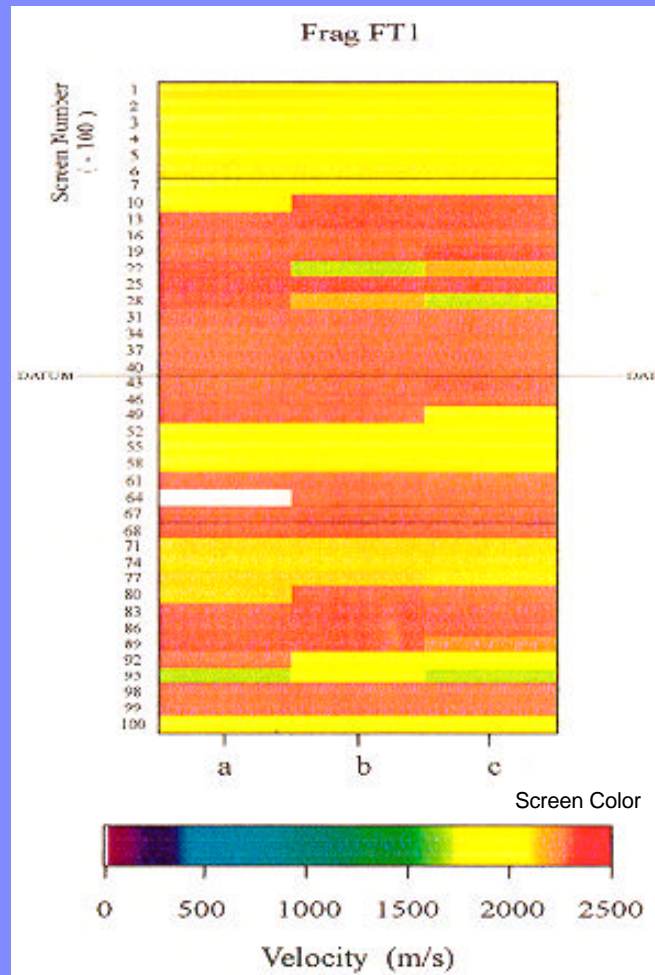
Fragment Pattern for BROACH System

Pattern shown for simultaneous initiation of AC and FTB

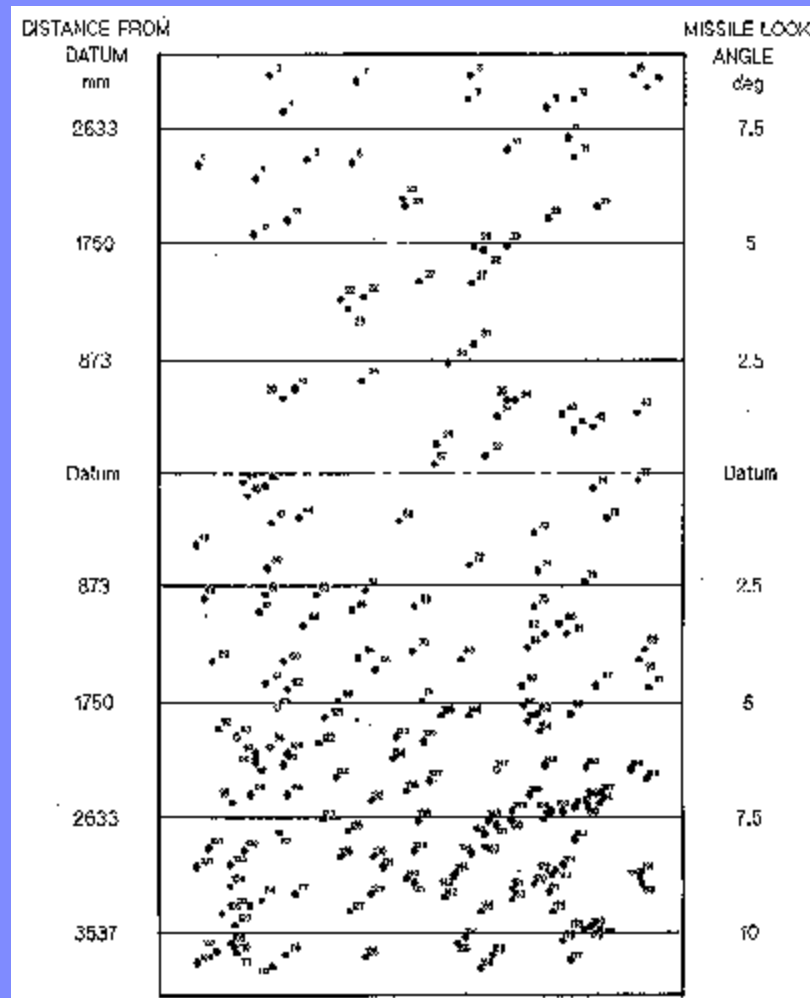


Static Ejection Characteristics

Color Plot of VAS Results



BROACH Steel Target Analysis

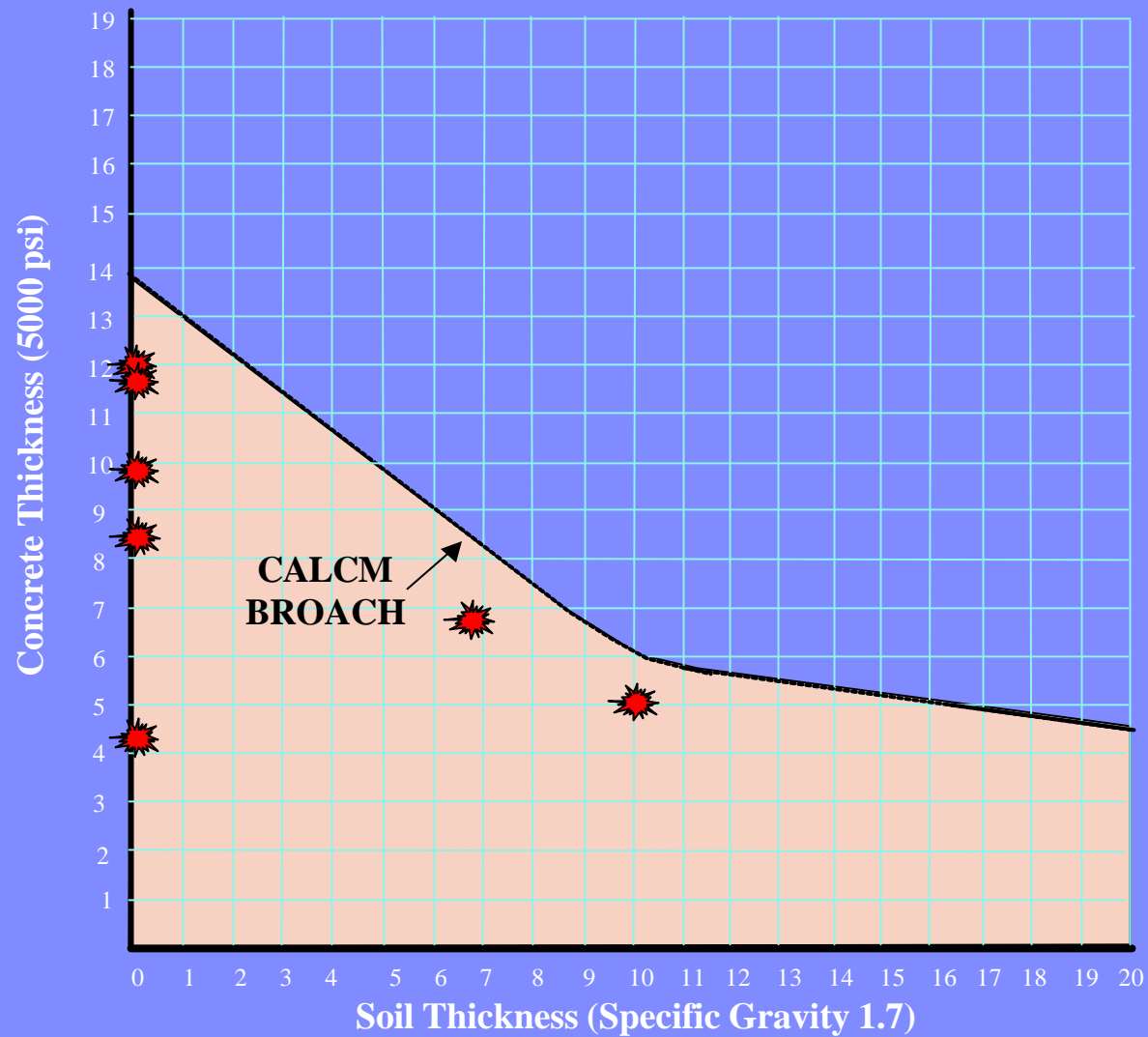


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Comparison of Capabilities Against Soil/Concrete Targets
(1000 ft/sec)

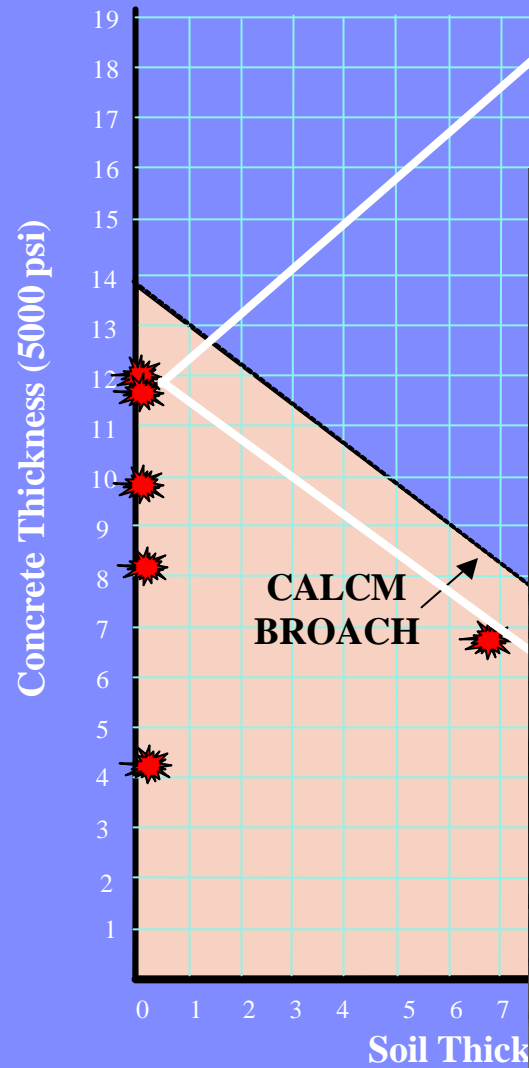


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Comparison of Capabilities Against Soil/Concrete Targets (1000 ft/sec)

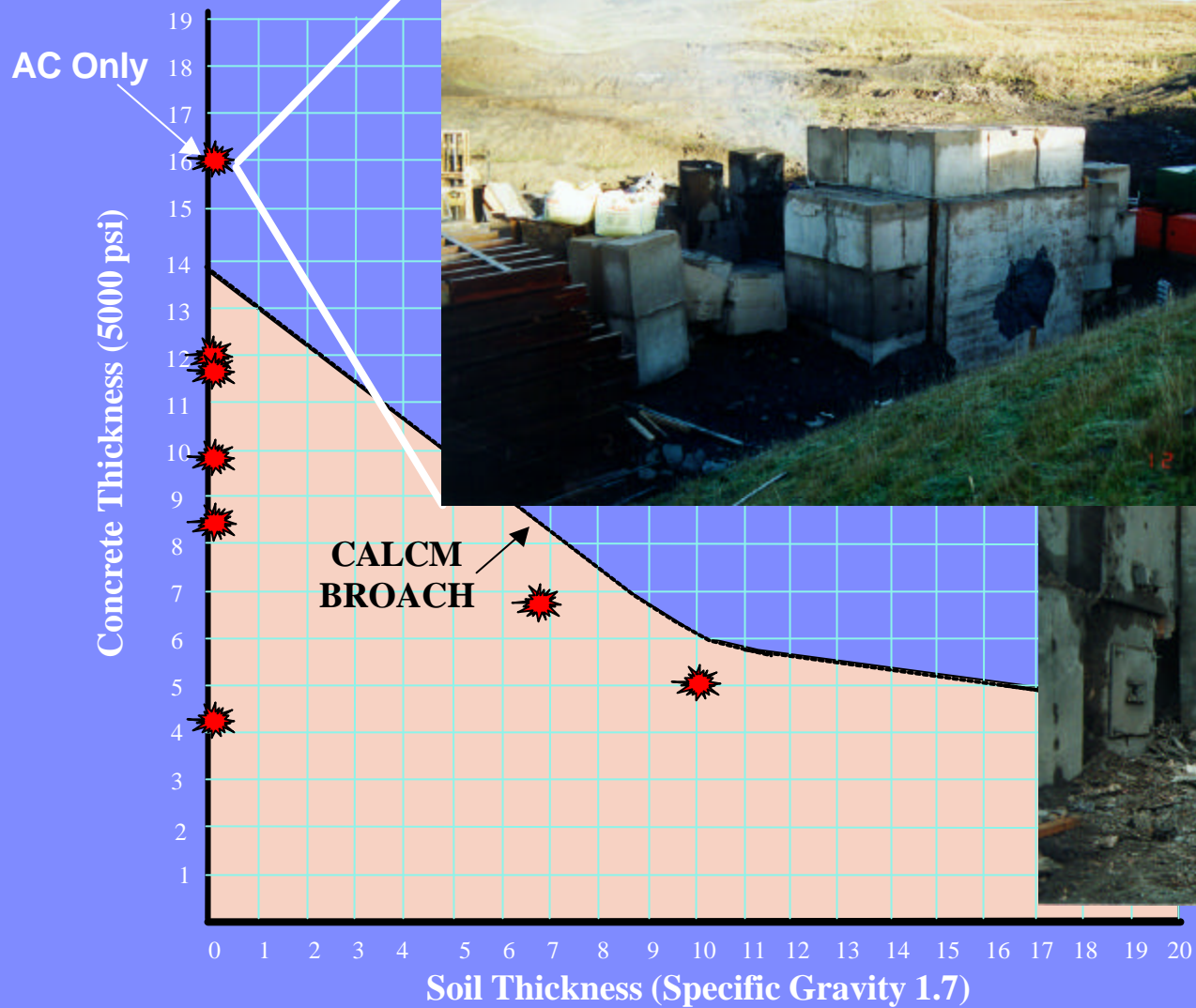


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Comparison of Capabilities Against Soil/Concrete Targets



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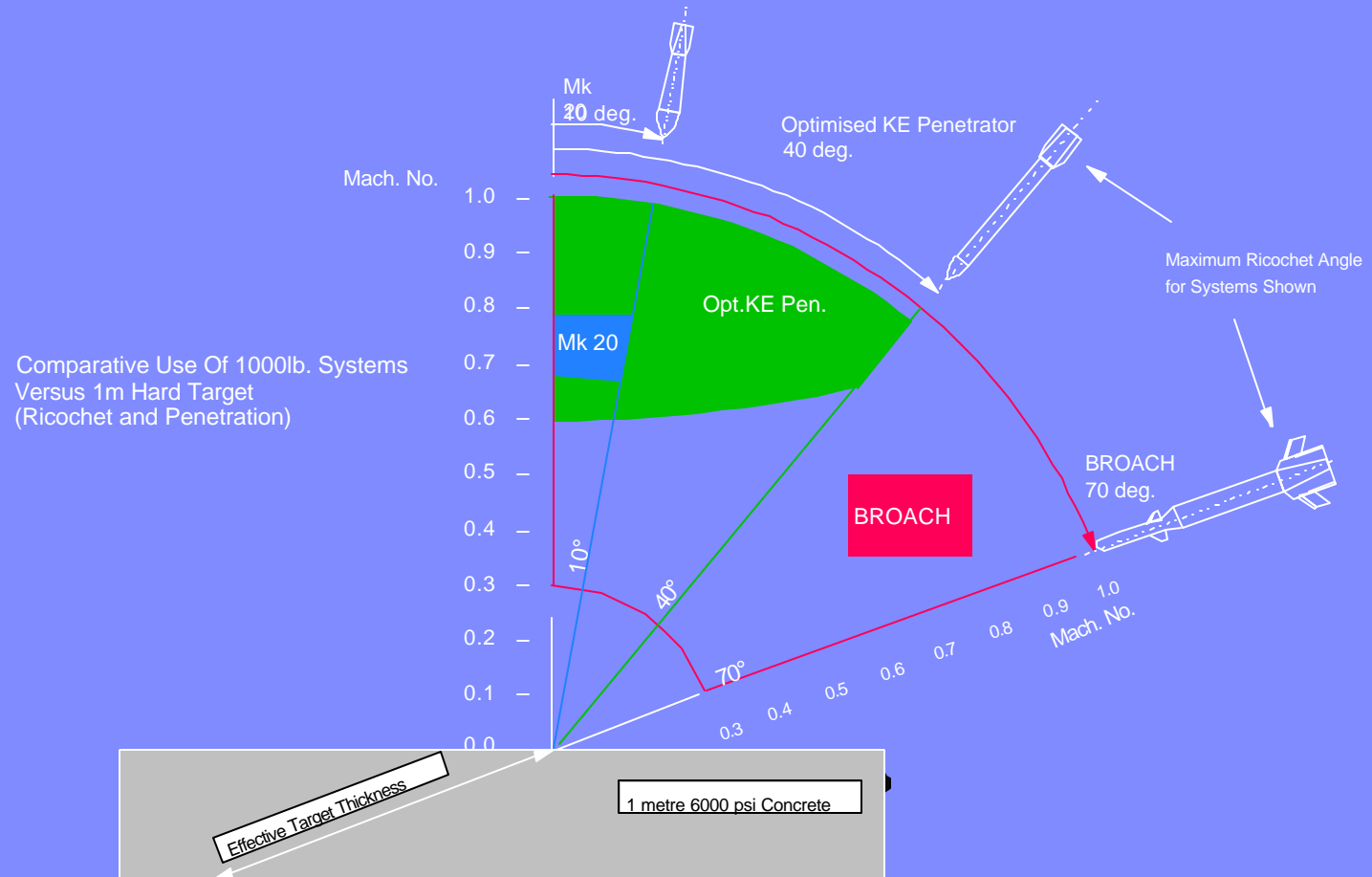


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COMPARATIVE EFFECT OF IMPACT VELOCITY AND ANGLE ON PERFORATION OF A FINITE TARGET

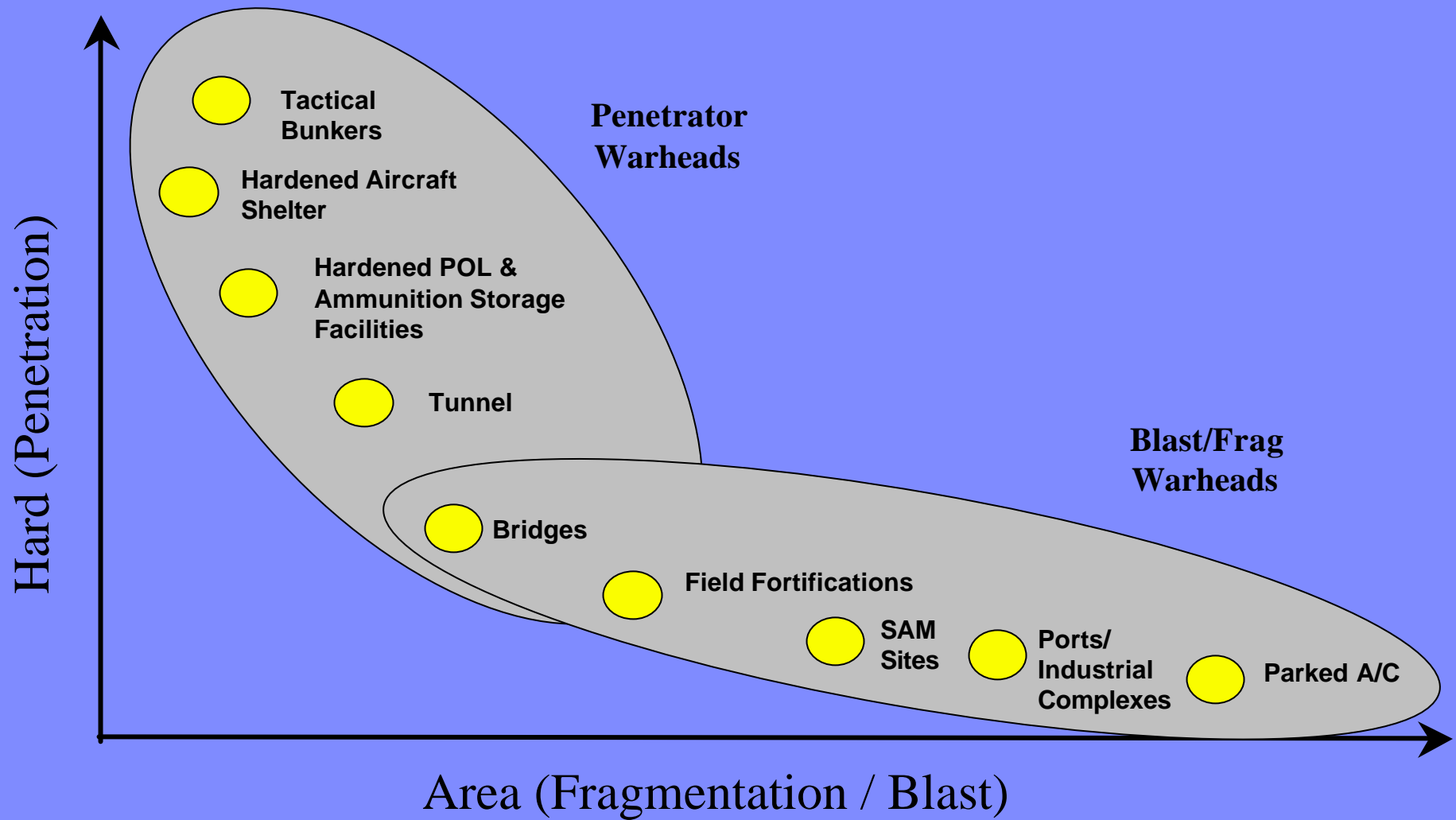


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JSOW Broach Target Spectrum



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BROACH Penetration Ability

Preliminary Perforation Performance vs. JSOW Target Requirement

VELOCITY	400 fps					500 fps					800 fps				
OBLIQUITY	0	15	30	45	60	0	15	30	45	60	0	15	30	45	60
TARGETS															
1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
7	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	
8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
9	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
10						✓					✓	✓	✓		
11	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	
12	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓



Full capability



Marginal capability



No capability

JSOW BROACH Kills 98% of NNOR Penetration Targets

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On Going Work

Storm Shadow

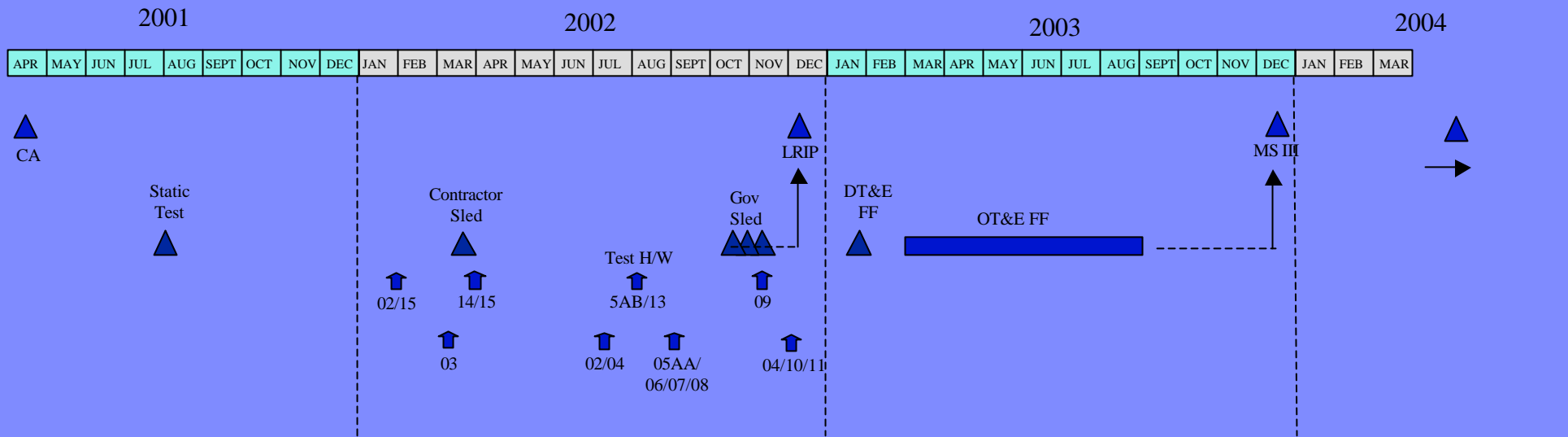
Design

Production

JSOW

Integration

Production



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